

CTE Flipped Grant Report
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BIOL 101L and BIOL 102L (Biological Principles I and II Laboratories)
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We were awarded a Teaching Innovation grant for Flipped Course Development of two introductory biology laboratory courses that are required for several majors. Approximately 1200-1400 students are enrolled yearly in Biol 101L and Biol 102L. Our goals were to:

1. Improve students' pre-lab preparation by providing additional high quality online instructions before class.
2. Equalize the assessment of students' work by providing more online assignments with automatic grading.
3. Teach graduate teaching assistants how to incorporate active learning strategies and flipped classroom techniques into the instructional process of both the Biology 101 and 102 Labs.
4. Improve coordination between instructors of lab and lecture courses with the ultimate goal of aligning course material for more efficient distribution of topics between courses which will also allow for the labs to enhance and reinforce the material covered in lecture.

To meet our first goal, we made a collection of power point presentations and videos to use in class and for homework assignments. A set of original videos was created for Biol 102L; videos from YouTube and other sources were used for Biol 101L. We provided presentations of concepts and actual laboratory exercises for students to watch before they attended lab. This way we were able to remove a large portion of lecturing from the lab to allow more hands-on experimentation. Also, it allowed us to dedicate more in class time to independent work on tasks that were usually difficult to students (statistical analysis, graphical representations of experimental data, literature search, etc) and to provide them with individual help when needed. As a continuation of the idea to improve pre-lab students' preparation, a new electronic lab manual was designed for Biology 101 lab. Each chapter of the manual has three parts: pre-lab reading, protocol for the upcoming lab procedure, and pre-lab quiz. The first attempt to use this manual was done during the summer of 2016. Next step planned is to implement it at a larger scale on 11 sections of Biol 101L during the spring of 2017.

Each pre-lab assignment was followed by an online quiz that tested students on the aforementioned presentations. Quiz banks for that task were prepared with the very valuable help of CTE instructional designers Gloria Washington and Lydia Frass. We also utilized the designers in finding websites with appropriate preparatory materials in order to eliminate some of our own filming if videos with the material needed already existed.

Implementation of the online quizzes was very successful. Automatically graded quizzes have fantastic advantages, especially in courses with a large number of sections taught by different teachers. First, grades are automatically and instantly on Blackboard providing immediate feedback to students, saving time to TAs (no grading) and to lab coordinator (there is no need to push TAs to upload grades on time). Second, TAs can easily make quizzes available for the students from their sections attending different classes during the week. Third, they also provide a more even distribution of grades between sections as all students are tested in the same manner without the bias of their teaching assistant. Production and implementation of on-line quizzes fulfilled goal #2.

Our third goal was to teach graduate assistants how to incorporate active learning strategies and flipped classroom techniques into the instructional process. It is still a work in progress, but

some big steps were done in this direction. New flipped activities were incorporated into the labs. We practice them with teaching assistants during the weekly preparatory meetings to give the teaching assistants the student experience before attempting to lead the lab.

Another step in this direction was establishing Senior TA positions in Biol 101L. The original idea was introduced to us during one of the CTE workshops as a possible structure to assist in working with courses with a large number of sections. Senior TA is a paid position with a one year commitment offered to experienced graduate students who taught Biol 101L previously. Each senior TA is in charge of a group of 7-9 TAs to help them with curriculum, lab prep, Blackboard, grading, etc. Classes taught by senior TAs are available for observations for new TAs. The first senior TAs were hired at the beginning of Summer 2016, and now we are finishing the first semester with them working. It was a very positive experience for all three parties involved: new graduate students teaching for the first time, senior TAs themselves, and the lab coordinator. New TAs appreciated the opportunity to communicate and get help from peers, it was easier for them. The possibility to attend a class taught by an experienced TA was very valuable too. Senior TAs were also running weekly preparatory meetings instead of the lab coordinator for the first time. It was an appreciated challenge for them providing a higher-level experience to engage with a more advanced audience into introductory level activities.

Goal 4 to improve coordination between instructors of lab and lecture courses was very ambitious as many of the lectures do not follow the same order of materials at this time so it is nearly impossible to align the course material with all sections of the lecture.

Nevertheless we were able to move in this direction too. Very good working relationships have been established between lecture professors and lab coordinators. Collaboration between Biology 101 professor Alan White, teaching graduate assistant Eric Goff, and lab coordinator Elina Levina during Fall 2015-Spring 2017 allowed to run a big experiment to study and compare different teaching methods in introductory biology class.

In order to meet our goals, we met with our fellow flipped grant recipients several times. At these meetings we discussed best practices for flipped learning. This time was invaluable as it provided us with new ideas and allowed us to run through some of our own concepts before implementing them in the lab. We were eager to meet with our cohorts as we were all utilizing different tools that could be shared amongst the group.

Participation in a campus-wide presentation was one of the important goals of the grant. We shared one of our flipped laboratory exercises at CTE STEM Active Learning workshop in February of 2016. We were invited to present at the Provost Undergraduate Summit for Faculty: Integrative and Experiential Learning on May 10 of 2016.

We are very thankful to those at the Center for Teaching Excellence, especially Janet Hudson, as well as the other members of our cohort.